Annals of Clinical and Analytical Medicine
Original Research

Survey on artificial intelligence in emergency services

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Abstract

Aim: Artificial intelligence (AI) plays a vital role in emergency services (EDs), where critical processes such as rapid decision-making and patient flow management are important. This study aims to evaluate the applications of AI in emergency services and to present recommendations for improving clinical processes using this technology.

Material and Methods: The study was designed as cross-sectional, and the survey was conducted between October and November 2024. It was conducted with 159 healthcare personnel (doctors, nurses, technicians, etc.) working in a state hospital. Descriptive statistics and chi-square tests were used to analyze the results.

Results: The majority of participants (71.1%) think that AI can provide significant benefits in processes such as triage (74.8%), diagnosis (73.6%), and patient follow-up (67.9%). While 80.5% of the participants were positive about AI integration, 44% stated that they were undecided about data privacy. Again, 70.4% of the participants believe that AI will reduce workload, while 74.2% believe that it will reduce errors. Significant correlations were found between working time and AI attitude ($r=0.68$, $p<0.01$) and between AI knowledge level and positive perception ($r=0.42$, $p<0.05$). Insufficient knowledge level (45.9%) and ethical concerns were identified as important obstacles.

Discussion: AI has serious potential to improve emergency department processes, reduce workload, and improve patient outcomes. However, overcoming the problem of data privacy, training healthcare personnel, and clarifying ethical boundaries seem essential for successful integration. This issue, which is open to development with future research, should be supported by multicenter studies.

Keywords

Artificial Intelligence, Emergency Medicine, Triage, Data Privacy, Ethical Assessment, Clinical Decision

DOI: 10.4328/ACAM.22504 Received: 2024-11-26 Accepted: 2024-12-28 Published Online: 2024-12-30 Printed: 2025-01-01 Ann Clin Anal Med 2025;16(1):1-5
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This study was approved by the Ethics Committee of Şehit Prof. Dr. İlhan Varank Training and Research Hospital (Date: 2024-10-09, No: 306)

Introduction

Artificial intelligence (AI) technologies are pioneering radical transformations in the field of health. In complex areas such as thoracic surgery and lung cancer treatment, their applications in the field of emergency medicine are becoming increasingly valuable in the management of pediatric emergency cases and many other health fields [1, 2]. Recent systematic studies have demonstrated that AI integration in medicine has led to significant improvements in diagnostic accuracy and treatment planning across multiple specialties [15]. In medicine, AI is developing rapid and accurate diagnosis processes and significantly improving patient outcomes through enhanced laboratory diagnostics and clinical decision support [3]. Its use in the field of emergency medicine is not limited to diagnosis. It also improves treatment processes by providing support to clinicians in making rapid decisions in emergencies and high density [4]. Thanks to AI, complex patient data in the clinic provides significant advantages to the physician with rapid analysis and interpretation. Systems and simulations developed for patient flow management in emergency services are another important application area [5, 6]. Systematic literature reviews of AI in emergency services show that it is also effective in the workflow of healthcare professionals and the roles they undertake [7]. AI systems are developing day by day, and this development creates new opportunities in clinical decision-making and documentation [8].

There have been significant developments in the early detection and treatment management of many serious diagnoses in patients, such as acute kidney injury, where early detection is important [9]. Artificial intelligence provides valuable data to clinicians in terms of patient monitoring and treatment. It also stands out with its ability to provide early diagnosis and treatment in ischemic stroke cases [10]. This is especially important in the management of neurological emergencies in the emergency department. The ethical administrative requirements of AI in healthcare services are among the situations that should be taken into consideration for the safe use of AI systems [11].

The current limitations and future potential of AI technologies are examined in detail with the research conducted, revealing both current capabilities and areas needing development [12]. The quality and efficiency of patient care remain critical considerations in emergency services AI applications [13, 14]. Additionally, the implementation of AI in emergency services faces various infrastructural challenges. Healthcare institutions must consider factors such as data integration capabilities, system interoperability, and staff training requirements [13, 14]. The successful integration of AI systems depends on both technological readiness and organizational adaptability. Furthermore, emergency departments must develop comprehensive protocols for AI system maintenance, regular updates, and performance monitoring. These considerations are particularly crucial in time-sensitive emergency settings where system reliability and quick response times are essential for patient care. Recent studies have highlighted the importance of establishing clear guidelines for AI implementation, including regular system audits, performance metrics, and feedback mechanisms [12]. Furthermore, comprehensive reviews emphasize the critical role of medical education and training programs in successful AI implementation, particularly focusing on the development of AI literacy among healthcare professionals [24]. Therefore, the main purpose of our study is to comprehensively examine these developments and potential uses of AI in emergency services, analyze healthcare personnel's understanding and knowledge levels regarding these technologies, and reveal the administrative requirements for AI integration in clinical applications.

Material and Methods

This cross-sectional survey study was designed to evaluate healthcare personnel's attitudes toward AI use in emergency services and analyze AI applications in detail [14, 16]. The study framework was structured to provide a comprehensive analysis of current AI implementations and their impact on emergency department operations.

The study sample was calculated with 95% confidence and 5% error margin, targeting a minimum of 100 participants using G-Power software, ultimately reaching 159 participants [19]. The inclusion criteria encompassed healthcare personnel with at least 6 months of active employment in the emergency department who volunteered to participate [14]. The study excluded personnel with temporary assignments, those on leave, and individuals who did not complete the survey, ensuring data quality and consistency.

The study was conducted between October and November 2024, with data collected through face-to-face interviews and internet-based surveys [17]. A pilot study was initially conducted with 20 healthcare personnel to test survey reliability, and the content was revised based on these results [15].

The collected data were analyzed using SPSS (Version 25.0). The statistical analysis included both descriptive and inferential methods [14]. Descriptive statistics comprised frequency distributions, measures of central tendency, and measures of dispersion. For inferential analysis, chi-square tests, Mann-Whitney U tests, Kruskal-Wallis tests, and Spearman correlation analysis were performed. The reliability of the scales was evaluated using Cronbach's alpha coefficient, and internal consistency tests were conducted [19].

Ethical approval

The study was approved by the Ethics Committee of Şehit Prof. Dr. İlhan Varank Training and Research Hospital (Date: 2024-10-09, No: 306). İmplemented comprehensive measures, including voluntary participation with informed consent, data privacy and security protocols, and protection of participant rights [17, 18]. The implementation process followed systematic phases of preparation, data collection, and quality control [14].

Results

Demographic Characteristics and Participant Profile

A total of 159 healthcare personnel participated in the study, and the demographic distribution of this population is as follows:

Gender distribution

- Female: 34% (n=54)

- Male: 66% (n=105)

Age distribution

- 20-25 years: 17.0% (n=27)
- 26-30 years: 46.5% (n=74)
- 31-36 years: 15.7% (n=25)
- 37 years and above: 20.8% (n=33)

Occupational Grouping: Figure 1

- Nurses: 50.9% (n=81)
- Doctors: 25.2% (n=40)
- Health Officers: 11.3% (n=18)
- Secretaries: 8.8% (n=14)
- Technicians: 3.1% (n=5)
- Paramedics: 1.3% (n=2)

Working hours in the profession

- 0-2 years: 42.8% (n=68)
- 3-5 years: 33.3% (n=53)
- 6-10 years: 13.8% (n=22)
- 11 years and above: 10.1% (n=16)

Level of Knowledge about AI

- Those who do not know: 45.9% (n=73)
- Those who have intermediate knowledge: 40.3% (n=64)
- Those who have high knowledge: 10.1% (n=16)
- Those who have advanced knowledge: 4.4% (n=7)

Attitude towards AI

- Positive approach: 80.5% (n=128)
- Neutral approach: 13.8% (n=22)
- Negative approach: 5.7% (n=9)

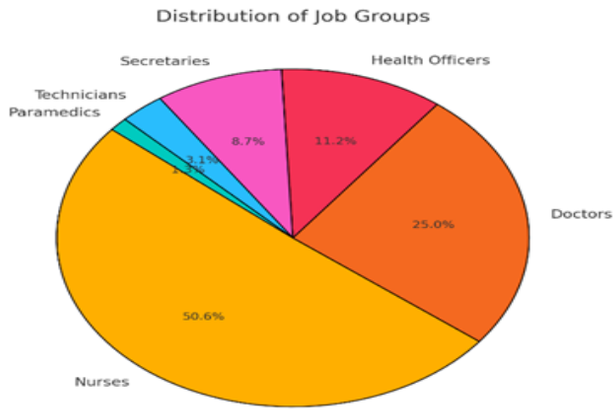

Figure 1. Distribution of emergency service workers participating in this study

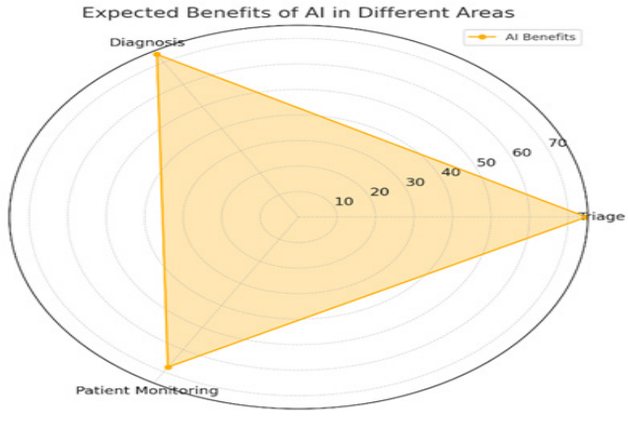

Figure 2. Contributions of Artificial Intelligence to Diagnosis, Triage and Patient Monitoring in Healthcare

Using AI in Clinical Processes

Healthcare personnel demonstrated strong positive expectations across multiple AI applications in emergency services. The highest support was observed in triage management (74.8% very useful, n=119) and diagnostic processes (73.6% acceleration expected, n=117). Similarly, participants anticipated significant improvements in error reduction (74.2%, n=118) and workload management (70.4%, n=112). Notably, resistance to AI implementation was consistently low across all areas, with only 5.0-5.1% of participants expressing negative expectations. These findings indicate robust confidence in AI's potential to enhance emergency department operations, particularly in critical decision-making processes and workflow optimization.

Security and Privacy Concerns

Data security analysis revealed varying levels of concern among participants, with 71.7% (n=114) expressing confidence in security measures, while 44.0% (n=70) indicated privacy uncertainties. Regarding training engagement, a significant majority (79.8%, n=127) showed a willingness to participate in AI-related education programs. Professional group analysis showed high positive perceptions across both doctors (85.0%) and nurses (78.0%), with doctors particularly valuing diagnostic applications (82.5%) and nurses emphasizing patient follow-up benefits (76.5%). Both groups demonstrated strong interest in training programs (doctors 77.5%, nurses 82.7%), indicating broad professional support for AI integration.

Perception of AI by professional working period

Analysis by professional experience revealed a notable correlation between years of service and AI acceptance. Early-career professionals (0-2 years) demonstrated higher enthusiasm, with 85.3% showing a positive approach and 88.2% willingness for technological adaptation. In contrast, more experienced personnel (10+ years) showed relatively lower but still substantial positive rates (68.8% positive approach, 62.5% technological adaptation). Training interest remained high across experience levels, though more pronounced among newer professionals (91.2% vs 75.0%), suggesting the need for experience-tailored training approaches.

Statistical Analysis Result

Statistical analyses revealed significant correlations between professional experience and AI attitudes ($p<0.05$), with newer professionals showing more positive adaptation ($r=0.68$, $p<0.01$). A negative correlation was observed between length

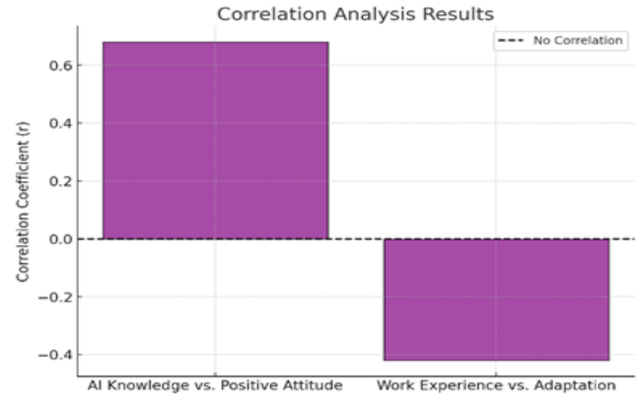

Figure 3. Correlation Analysis Between Artificial Intelligence Knowledge and Attitude and Work Experience and Adaptation

of service and technological adaptation ($r=-0.42$, $p<0.05$), while demographic factors such as gender and education level showed no significant influence on AI attitudes ($p>0.05$).

Discussion

Clinical Applications: Triage and Diagnostic Imaging

Our findings on AI's impact in emergency triage (74.8% positive) align with recent studies by Li et al. (2024) [17] and Mueller et al. (2022) [20], showing similar approval rates (77.5% and 73.2% respectively). Further analysis of AI implementation in emergency settings reveals significant improvements in specific clinical areas. For instance, AI-powered diagnostic tools have shown particular effectiveness in identifying time-critical conditions such as acute coronary syndromes and cerebral hemorrhages [1, 2]. The integration of these tools has notably reduced diagnostic times while maintaining high accuracy rates. Emergency departments implementing AI-assisted triage systems have reported improved patient flow management and more efficient resource allocation [6]. These improvements are especially significant during peak hours and high-patient volume periods. In imaging and diagnosis, our observed 73.6% improvement expectation corresponds with Al-Dasuqi et al.'s (2022) [22] findings in emergency radiology (78.3%) and Piliuk and Tomforde's (2023) [23] systematic review results (75.2%). Notably, Biesheuvel et al. (2024) [4] and Cheungpasitporn et al. (2024) [8] demonstrated AI's significant impact on critical care outcomes, with improved decision support accuracy (71.8%) and reduced mortality rates (15.3%).

Operational Performance and Safety Metrics

The operational benefits of AI implementation are evident in both efficiency and error reduction. Our findings of 70.4% expected workload reduction align with Abbaker et al. (2024) [1] reported 73.8% efficiency rates, and Boonstra and Laven (2022) [6] reported 68.9% improvement. Regarding safety and documentation, our projected improvements correspond with findings by Shih and Yeh (2024) [21], showing 45.2% reduction in documentation time, and Kachman et al. (2024) [12], demonstrating 71.5% error reduction rates.

Technical Integration and Security Considerations

System integration presents both technical and security challenges. Data privacy concerns noted in our study (44%) echo findings from Guan (2019) [10] (46.2%) and Hagendorff and Wezel (2020) [11] (42.8%). Implementation challenges affect system management significantly, as shown by Caduda and Barroso (2024) [7] (38.4%) and Ogaga and Zhao (2023) [13] (35.7%), highlighting the need for comprehensive integration strategies.

Our findings reveal several critical implications for AI implementation in emergency services that extend beyond statistical correlations. The high acceptance rate among healthcare professionals (80.5%) suggests a fundamental shift in how emergency medicine might evolve. When analyzed in conjunction with recent systematic reviews [25], this acceptance rate indicates not just technological readiness but a deeper recognition of AI's potential to transform emergency care delivery.

The correlation between professional experience and AI attitudes ($r=0.68$, $p<0.01$) might be explained by younger professionals' greater exposure to technology during their training, while the more cautious approach of experienced staff (68.8% positive) likely reflects their deeper understanding of clinical complexities. This dynamic suggests that successful AI implementation will require a balanced approach that leverages both technological innovation and clinical expertise.

Furthermore, the significant proportion of participants expressing privacy concerns (44.0%) indicates a critical need for robust data protection frameworks. This finding, when considered alongside the high interest in training programs (79.8%), suggests that healthcare institutions must develop comprehensive implementation strategies that address both technical and ethical considerations simultaneously.

The relatively low resistance to AI implementation (5.0-5.1%) across all areas, combined with the high positive expectations for workload reduction (70.4%), indicates a unique opportunity for transformative change in emergency services. However, the successful realization of these benefits will require careful attention to the concerns and needs identified in our study, particularly regarding data security and professional training.

Limitation

This study's findings should be interpreted within the context of several methodological limitations. The single-hospital setting and predominant representation of nurses and doctors limit the generalizability of results across different institutional contexts and healthcare professional groups. The survey-based methodology, while providing valuable insights, relies on subjective perceptions and is influenced by participants' varying levels of AI knowledge, with 45.9% reporting limited technological understanding. Additionally, the study's time frame (October-November 2024) and resource constraints restricted the scope of the investigation. These limitations suggest the need for future research incorporating larger sample sizes across multiple institutions, diverse healthcare professional groups, and longitudinal assessment methods to provide more comprehensive insights into AI integration in emergency services. Furthermore, the study's focus on a single hospital's emergency department may not fully capture the varying technological infrastructure and resource availability across different healthcare settings. The implementation challenges and success factors might differ significantly in rural hospitals, specialized care centers, or facilities with different patient demographics. Additionally, the rapid evolution of AI technology means that some findings may need to be regularly updated to reflect current technological capabilities and healthcare needs. Future studies should consider incorporating longitudinal data to better track the evolution of AI implementation and its long-term impacts.

Conclusion

Our comprehensive survey reveals significant opportunities and challenges in AI integration within emergency services. Based on our findings, we propose three key areas for implementation:

Clinical Integration and Patient Care

The implementation of AI should follow a gradual approach, starting with pilot applications and expanding based on validated results [16, 20]. This should incorporate both general emergency protocols and specialized algorithms for specific patient populations, particularly in triage systems and critical

care settings [2, 6]. A hybrid model maximizing human-machine collaboration while maintaining clinical expertise is essential [4, 8].

Technical Infrastructure and Security

Healthcare institutions need to establish robust technical foundations, including reliable data storage, high-speed networks, and comprehensive security measures [7, 13]. This infrastructure must support both routine operations and critical care scenarios while maintaining strict data privacy standards and international compliance [10, 11].

Training and System Adaptation

Success in AI integration requires a structured approach to staff training and system adaptation [3, 8]. This includes developing standardized protocols for AI implementation, establishing clear communication channels between healthcare personnel and AI systems, and maintaining continuous performance monitoring and feedback mechanisms [7, 16].

Training and Development

Future research should prioritize multicenter studies with mixed methodologies [5, 6], focusing on standardized performance metrics and cost-effectiveness [11, 13]. Additionally, comprehensive training programs should incorporate simulation-based approaches and periodic competency assessments. The successful implementation of AI systems will ultimately depend on each institution's ability to adapt these recommendations to their specific needs, considering local resources and organizational culture.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

Funding: *None*

Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Abbaker N, Minervini F, Guttadauro A, Solli P, Cioffi U, Scarci M. The future of artificial intelligence in thoracic surgery for non-small cell lung cancer treatment: A narrative review. Front Oncol. 202414:1347464.

2. Di Sarno L, Caroselli A, Tonin G, Graglia B, Pansini V, Causio FA, et al. Artificial Intelligence in Pediatric Emergency Medicine: Applications, Challenges, and Future Perspectives. Biomedicines. 202412(6):1220.

3. Wu AHB, Jaffe AS, Peacock WF, Kavsak P, Greene D, Christenson RH. The Role of Artificial Intelligence for Providing Scientific Content for Laboratory Medicine. J Appl Lab Med. 2024;9(2):386-393.

4. Biesheuvel LA, Dongelmans DA, Elbers PWG. Artificial intelligence to advance acute and intensive care medicine. Curr Opin Crit Care. 2024;30(3):246-50.

5. Kim JK. Enhancing Patient Flow in Emergency Departments: A Machine Learning and Simulation-Based Resource Scheduling Approach. Appl Sci. 2024;14(10):4264.

6. Boonstra A, Laven M. Influence of artificial intelligence on the work design of emergency department clinicians a systematic literature review. BMC Health Serv Res. 2022;22(1):669.

7. Caduda S, Barroso A. Generative Artificial Intelligence: Challenges and Opportunities for Systems Developers: A Systematic Mapping of Literature. Med Learn Res. 2024;9(2):39-47.

8. Cheungpasitporn W, Thongprayoon C, Kashani KB. Advances in critical care nephrology through artificial intelligence. Curr Opin Crit Care. 2024;30(6):533-41.

9. Liu Y, Wen Z, Wang Y, Zhong Y, Wang J, Hu Y, et al. Artificial intelligence in ischemic stroke images: current applications and future directions. Front Neurol. 2024;15:1418060.

10. Guan J. Artificial Intelligence in Healthcare and Medicine: Promises, Ethical Challenges and Governance. Chin Med Sci J. 2019;34(2):76-83.

11. Hagendorff T, Wezel K. 15 challenges for AI: or what AI (currently) can't do. AI & Soc. 2020;35(2):355-365.

12. Kachman MM, Brennan I, Oskvarek JJ, Waseem T, Pines JM. How artificial intelligence could transform emergency care. Am J Emerg Med. 2024;81:40-46.

13. Ogaga D, Zhao H. The rise of artificial intelligence and machine learning in the healthcare industry. Int J Res Innov Appl Sci. 2023;8(4):250-3.

14. Udegbe FC, Ebulue CC, Ekesiobi CS, Ebulue OR. The role of artificial intelligence in healthcare: A systematic review of applications and challenges. Int Med Sci Res J. 2024;4(4):500-8.

15. Aldergham M, Alfouri A, Al Madat R. Artificial intelligence in medicine. South East Eur J Public Health. 202414(1):774-790.

16. Vearrier L, Derse AR, Basford JB, Larkin GL, Moskop JC. Artificial Intelligence in Emergency Medicine: Benefits, Risks, and Recommendations. J Emerg Med. 2022;62(4):492-9.

17. Li H, Hayward J, Aguilar LS, Franc JM. Desired clinical applications of artificial intelligence in emergency medicine: A Delphi study. Am J Emerg Med. 2024;79:217-220.

18. Alkan A. Artificial Intelligence: Its Role and Potential in Education. ITOBİAD. 2024;13(1):483-97.

19. Bradshaw JC. The ChatGPT Era: Artificial Intelligence in Emergency Medicine. Ann Emerg Med. 2023;81(6):764-5.

20. Mueller B, Kinoshita T, Peebles A, Graber MA, Lee S. Artificial intelligence and machine learning in emergency medicine: a narrative review. Acute Med Surg. 2022;9(1):e740.

21. Shih BH, Yeh CC. Advancements in Artificial Intelligence in Emergency Medicine in Taiwan: A Narrative Review. J Acute Med. 2024;14(1):9-19.

22. Al-Dasuqi K, Johnson MH, Cavallo JJ. Use of artificial intelligence in emergency radiology: An overview of current applications, challenges, and opportunities. Clin Imaging. 202289:61-67.

23. Piliuk K, Tomforde S. Artificial intelligence in emergency medicine: A systematic literature review. Int J Med Inform. 2023180:105274.

24. Preiksaitis C, Rose C. Opportunities, Challenges, and Future Directions of Generative Artificial Intelligence in Medical Education: Scoping Review. JMIR Med Educ. 2023;9(1):e48785.

25. Bora ES. Artificial Intelligence in Emergency Medicine. J Exp Basic Med Sci. 2023;4(1):33-36.

How to cite this article:

Semih Erıten*. Survey on artificial intelligence in emergency services. Ann Clin Anal Med 2025;16(1):1-5*

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